GEOLOGY, ENERGY, AND MINERAL (GEM) RESOURCE ASSESSMENT OF THE BIRDSEYE GEM RESOURCE AREA (GRA) WYOMING, INCLUDING THE COPPER MOUNTAIN WILDERNESS STUDY AREA (WY-030-111)

PHASE I

Contract No. YA-553-CT2-1055

Prepared for:

U.S. Bureau of Land Management

Prepared by:

Tetra Tech, Inc.
Pasadena, California

September 1983

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EXECUTIVE SUMMARY

The U.S. Bureau of Land Management (BLM) has adopted a two-phase procedure for the integration of geologic, energy, and mineral (GEM) resources data concerning Wilderness Study Areas (WSAs). To facilitate this review, certain WSAs with similar geologic environments and mineral characteristics have been grouped together into larger GEM Resource Areas (GRA). Using these guidelines, the Copper Mountain WSA was grouped into the larger Birdseye GRA. This report, which terminates the Phase I activities for the Birdseye GRA, is an evaluation and interpretation of existing data concerning the GEM resource potential in the Copper Mountain WSA.

The Birdseye GRA contains one WSA: the Copper Mountain WSA (WY-030-111). This WSA is located in BLM's Lander Resource Area, Rawlins District, Wyoming.

The Copper Mountain WSA has been identified as having a high favorability for the potential occurrence of uranium, a low favorability for the potential occurrence of oil and gas, and a moderate favorability for the potential occurrence of limestone. The potential occurrence of other GEM resources in the WSA is considered low due to lack of adequate geologic data and unfavorable environments.

The Copper Mountain WSA is considered to have a high favorability based on direct, but quantitatively minimal evidence for the occurrence of uranium in that part of the Wind River Formation that underlies the WSA (classified 4C); this designation is based upon a favorable geologic environment and known reserves in similar units to the east (Hesse, 1982). The WSA is considered to have a low favorability based on direct, but quantitatively minimal evidence for the occurrence of oil and gas (classified 2C); this classification is based upon the region's structural complexity and the potential lack of a suitable trap. The WSA is considered to have a high favorability based on quantitatively minimal evidence for the potential occurrence of limestone (classified 4C); this classification is based on the occurrence of the Madison Limestone in the WSA (Thaden, 1978). Quantitatively minimal direct evidence

exists to support a low favorability classification for the potential occurrence of all other GEM resources. This classification is based on the geologic environment and inferred geologic processes that have been identified within the WSA.

Additional investigations would help supplement the GEM resource evaluation of the Copper Mountain WSA. These investigations should include an examination of well logs to identify and evaluate suitable stratigraphic and structural horizons for the accumulation of hydrocarbons, and detailed geologic and stratigraphic mapping of the Wind River Formation to determine the favorability of the unit as a suitable host rock for uranium. A moderate amount of geologic information exists which should be reviewed by BLM personnel to gain additional insight into the potential occurrence of GEM resources prior to making management decisions concerning the WSA.

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GEM RESOURCE AREA

BIRDSEYE

1.0 INTRODUCTION

1.1 Purpose of Study

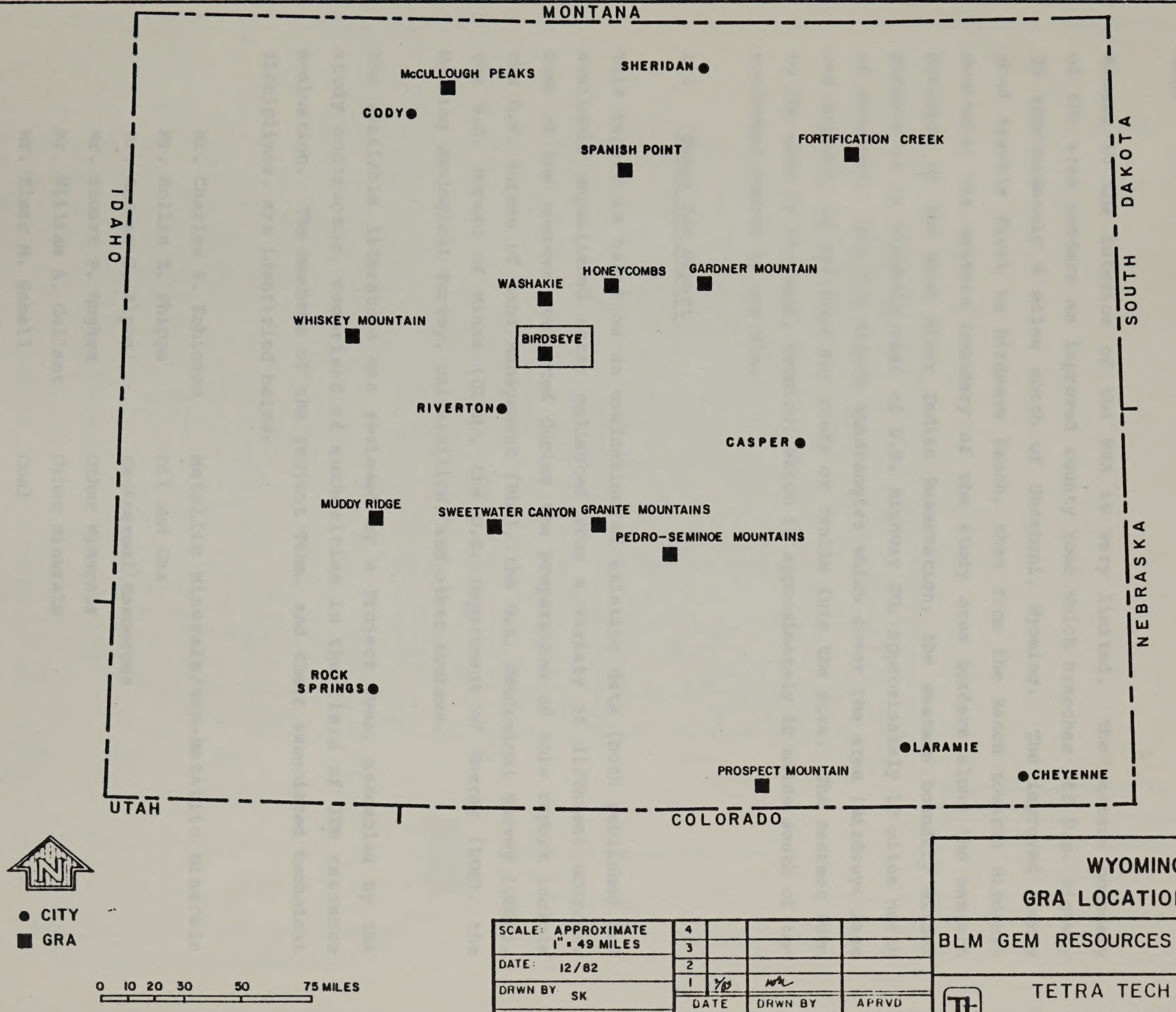
The U.S. Bureau of Land Management (BLM) has adopted a two-phase procedure for the integration of geologic, energy, and mineral (GEM) resources data for suitable/nonsuitable decisions concerning Wilderness Study Areas (WSAs). Phase I consists of a review and evaluation of existing data, resulting in an interpretation of the GEM resource potential of the WSAs. Phase II is designed to generate only the additional data required to support the GEM resource recommendations presented during Phase I. To facilitate this review, certain WSAs with similar geologic and mineral characteristics have been grouped together into larger GEM Resource Areas (GRAs). Using these guidelines, the Copper Mountain WSA was grouped into the larger Birdseye GRA. This report, which terminates the Phase I activities for the Birdseye GRA, is an evaluation and interpretation of existing data concerning the Copper Mountain WSA.

The GEM resource evaluation for this study was performed by Tetra Tech, Inc. for the U.S. Bureau of Land Management, under Contract No. YA-553-CT2-1055. This study was completed in January, 1983.

1.2 Location and Access

This GEM report covers the area identified as the Birdseye GEM Resource Area (GRA); the geographic location of the study area is shown in Figure 1.1, "GRA Location Map."

The Birdseye GRA contains one WSA, the Copper Mountain WSA (WY-030-111). The WSA covers and area of approximately 6,858 acres in portions of Township (T) 40 North (N) and T 39 N, Range (R) 94 West (W) in western Fremont County, Wyoming. The WSA is located at approximately 108° 5'-10' longitude and 43° 23' 28' latitude. The Copper Mountain WSA is within the BLM's Lander Resource



WYOMING
GRA LOCATION MAP

BLM GEM RESOURCES ASSESSMENT

TETRA TECH INC.
PASADENA, CALIFORNIA

FIGURE 1.1

SCALE: APPROXIMATE 1" = 49 MILES
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Area, Rawlins District, Montana. Figure 1.2, "Topographic Map," illustrates the topography of the GRA, as well as the location of the WSA within the GRA.

Access to the interior of the WSA is very limited. The eastern boundary of the area borders an improved county road which branches off U.S. Highway 20 approximately 9 miles north of Shoshoni, Wyoming. The improved county road travels first to Birdseye Ranch, then from the Ranch towards Birdseye Mountain. The western boundary of the study area borders along the eastern boundary of the Wind River Indian Reservation; the western boundary either borders or is slightly east of U.S. Highway 20, approximately 10 miles north of Shoshoni. The 7.5 minute quadrangles which cover the area (Birdseye Pass and Boysen), do not show any roads or trails into the area. The nearest town to the area is Shoshoni, Wyoming, which is approximately 10 miles south of the southwest corner of the WSA.

1.3 Basis for Report

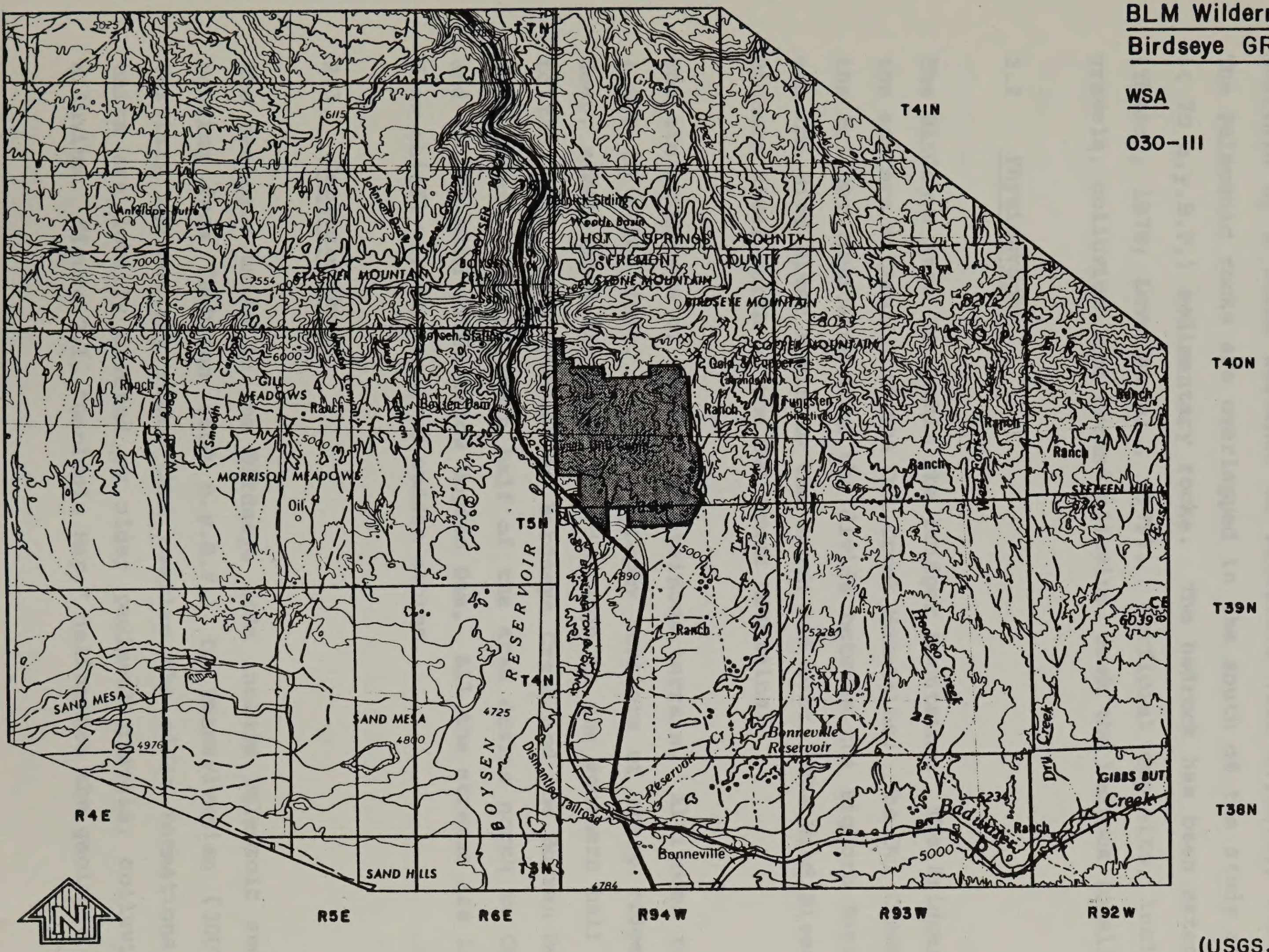
This report is based on an evaluation of existing data (both published and available unpublished data) collected from a variety of different sources. Some of the sources contacted during the preparation of this report include the U.S. Bureau of Land Management (BLM), the U.S. Geological Survey (USGS), the U.S. Bureau of Mines (USBM), the U.S. Department of Energy (DOE), the Wyoming Geological Survey, universities, and other sources.

The available literature was reviewed by a Project Team, assembled by the study contractor, comprised of authorities in the field of GEM resource evaluation. The members of the Project Team, and their associated technical disciplines, are identified below:

Mr. Charles S. Robinson	Metallic Minerals/Non-Metallic Minerals
Mr. Rollin E. Phipps	Oil and Gas
Mr. Andrew G. Alpha	Geothermal Resources
Mr. Stuart P. Hughes	Other Minerals
Mr. William A. Gallant	Other Minerals
Mr. Elmer M. Schell	Coal
Mr. John A. Hartley	Oil Shale/Paleontology

BLM Wilderness Study Areas Included in the Birdseye GRA

WSA	NAME	ACREAGE
030-111	Copper Mountain	6,858



(USGS, 1955; revised, 1974)
(USGS, n.d.)

NOTE: Contours in 200ft. Intervals

▨ Approximate Boundary of Wilderness Study Area

5 4 3 2 1 0 3 6 Miles

5 4 3 2 1 0 5 10 Kilometers

SCALE	1" = 4 MILES 1: 250,000
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Birdseye GRA, Wyoming

TOPOGRAPHIC MAP

BLM GEM RESOURCES ASSESSMENT
REGION 6 WYOMING and MONTANA

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FIGURE 1.2

2.0 GEOLOGY

2.1 General

The Birdseye GRA is on the northeast side of the Wind River Basin and on the southwest flank of the Bridger Mountains. The core of the region's mountains are Precambrian rocks (> 600 million years before present [m.y.B.P.]) that are overlain by a thick sequence of Paleozoic (225 m.y.B.P.) sedimentary rocks. The Paleozoic rocks are overlapped in the south of the study area by Tertiary (< 70 m.y.B.P.) sedimentary rocks. The bedrock has been extensively faulted (Thaden, 1978; Love et al., 1979). Surficial deposits, including pediment gravels, colluvium, and recent alluvium, mask the bedrock locally.

2.2 Physiography

The Birdseye area is within the Bridger Mountains. The Bridger Mountains are the eastern extension of the Owl Creek Mountains. The Owl Creek Mountains and the Bridger Mountains form the divide between the Bighorn Basin to the north and the Wind River Basin to the south and west. The Wind River is called the Bighorn River north of the Owl Creek Mountains.

The area consists of rugged, mountainous terrain. Altitudes range from about 4,800 to 6,300 feet. The topography consists of sharp ridges separated by deep, steep-sided canyons. The drainage in the southern half of the area is to the south and southwest to Birdseye Creek and the Boysen Reservoir on the Wind River. The northern half of the area drains north to Cottonwood Creek and to the Wind River below Boysen Dam. All the streams are intermittent and flow chiefly in response to sudden storms.

2.3 Geologic Units

The geologic units in the Birdseye area include Paleozoic sedimentary rocks ranging from Cambrian (600 m.y.B.P.) to Pennsylvanian (300 m.y.B.P.) and Tertiary sedimentary rocks that overlap the older formations. The bedrock units are locally covered by older pediment gravels, colluvium, and recent alluvium. Figure 2.1, "Geologic Map," delineates the geologic formations that

occur throughout the GRA. Figure 2.2, "Generalized Stratigraphic Column," is a generalized stratigraphic column that gives a brief description of all the stratigraphic units that underlie the Birdseye GRA.

2.3.1 Bedrock Units

The oldest bedrock unit exposed in the WSA is the Flathead Sandstone of middle Cambrian (500-600 m.y.B.P.) age. In areas to the north and east, the Flathead Sandstone overlies Precambrian rocks. Based on the mapping of Thaden (1980), the Precambrian rocks in adjacent areas are known to consist of a sequence of metasedimentary rocks that were intruded by granite. These same conditions would probably underlie the Flathead Sandstones in the Birdseye area.

Flathead Sandstone is predominantly sandstone but locally grades into and is interbedded with siltstone. At the base of the Flathead Sandstone is conglomeratic sandstone or conglomerate. The Flathead Sandstone was deposited on an irregular surface on the underlying Precambrian rocks. The Flathead Sandstone ranges from 0 to approximately 200 feet in thickness.

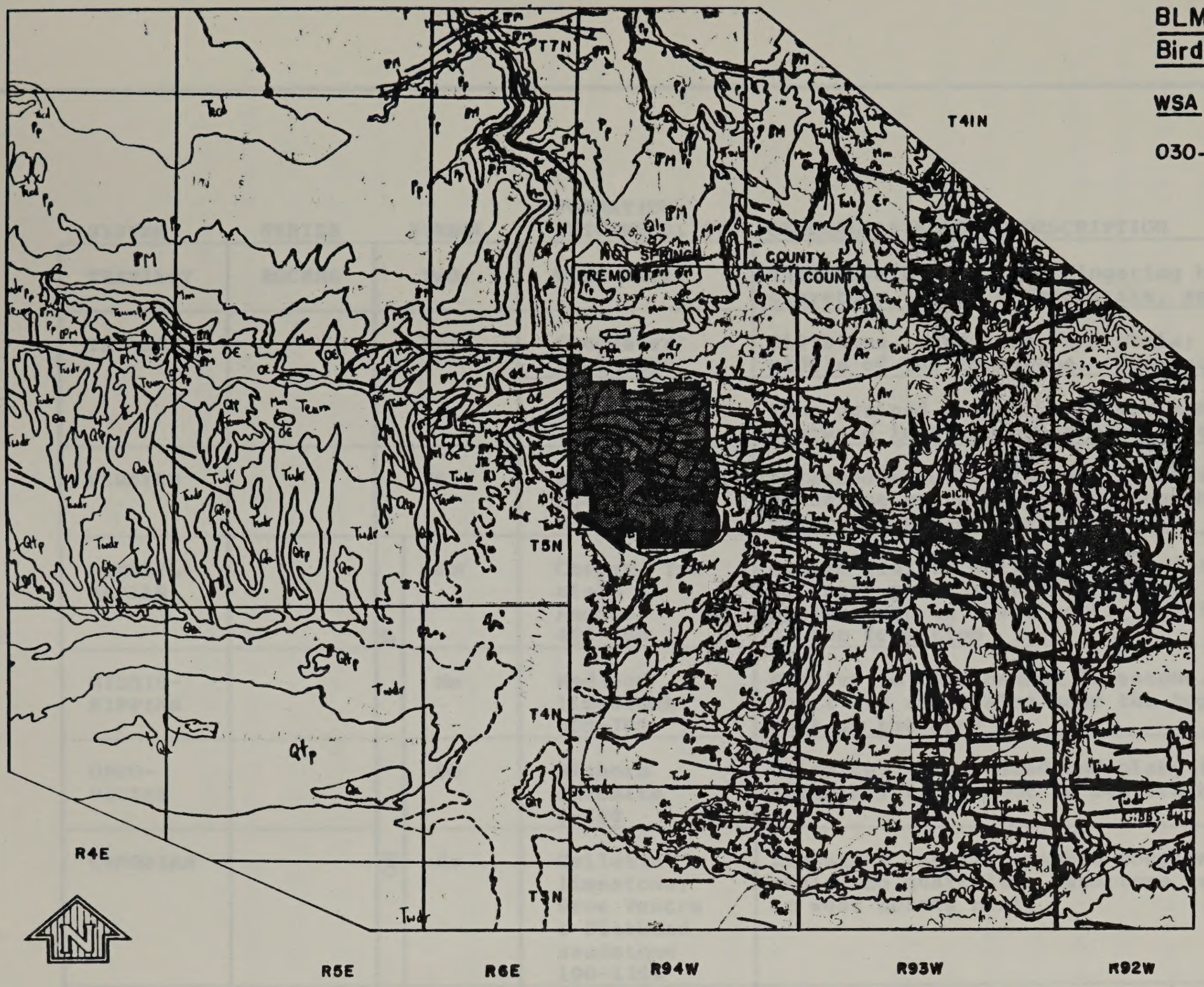
Overlying the Flathead Sandstone and gradational with it, is the Gros Ventre Formation of middle Cambrian age. The Gros Ventre Formation consists of siltstone, fine-grained sandstone, and locally limestone in the upper part. The Gros Ventre Formation is about 400 feet thick in this area.

Gallatin Limestone, of late Cambrian age, unconformably overlies the Gros Ventre Formation. The Gallatin Limestone is thin-bedded, silty, sandy and includes some interbedded siltstone. Limestone pebble conglomerates are common. The Gallatin Limestone ranges from about 300 to 700 feet in thickness.

The Bighorn Dolomite of late and middle Ordovician (440-500 m.y.B.P.) age unconformably overlies the Gallatin Limestone. Bighorn Dolomite consists predominantly of dolomite, but also contains lenses of fine-grained sandstone, as much as 6 feet thick near the base. The dolomite is generally fine-grained, massive, to indistinctly bedded, locally limey and slightly porous. The Bighorn Dolomite is approximately 65 feet thick.

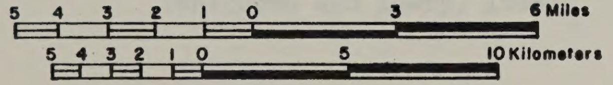
BLM Wilderness Study Areas Included in the Birdseye GRA

WSA	NAME	ACREAGE
030-111	Copper Mountain	6,858



(Love, J.D. et al., 1979)

▇ Approximate Boundary of Wildernes Study Area



SCALE: 1" = 4 MILES 1: 250,000	4				Birdseye GRA, Wyoming GEOLOGIC MAP
DATE: 12/82	3				BLM GEM RESOURCES ASSESSMENT REGION 6 WYOMING and MONTANA
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APRVD: WL	1	3/83	AK		FIGURE 2.1
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SYSTEM	SERIES	SYMBOL		FORMATION, THICKNESS, FT	GENERAL LITHOLOGIC DESCRIPTION
TERTIARY	EOCENE	Twdr		Wind River	Interlayered and interfingering beds of sandstone, siltstone claystone, local conglomerate, and discontinuous coal beds
TRIASSIC		Ꞧcd		Chugwater 1000-1300	Siltstone, sandstone, and shale; Alcova limestone member near middle of the formation. Present throughout the area
				Dinwoody 10-155	Fine-grained sandstone in western part of basin, grading eastward into the upper part of the Goose Egg formation
PERMIAN		Pp		Park City & equivalents 0-300	Interbedded dolomite, chert, limestone, siltstone, and sandstone containing a few phosphate beds or lenses and minor amounts of shale
PENNSYL-VANIAN		ℙ	ℙM	Casper, Ten-sleep & Amsden 400-900	Medium-grained well sorted sandstone, containing some limestone in upper part; increased amounts of limestone, dolomite, and shale occur in lower part. Darwin Sandstone at the base of the formation
MISSIS-SIPPIAN			Mm	Madison limestone 300-700	Massive to thin bedded limestone, containing seom thin beds of chert and red shales near the top. Present at depth throughout most of the area
ORDO-VICIAN		OЄ	Ob	Bighorn dolomite 0-200	Dolomite, thin bedded and platy in upper part but mostly massive; forms cliff; present in western half of basin
CAMBRIAN			Єr	Gallatin limestone, Gros Ventre & Flathead sandstone 100-1200	Limestone and flat-pebble conglomerate in upper beds; sandstone, shale and quartzitic sandstone in lower part; thins from east to west across basin
PRE-CAMBRIAN		Ar			Igneous and metamorphic rocks

Figure 2.2 Generalized Stratigraphic Column, Birdseye GRA.
(Whitcomb and Lowry, 1968)

The Madison Limestone of late to early Mississippian (300-350 m.y.B.P.) age unconformably overlies the Bighorn Dolomite. The Madison Limestone consists of dolomitic limestone and sandstone. Dolomite is fine-grained, limey, and clayey; limestone is fine-grained dolomite and clayey. Carbonate units are medium to massive bedded with indistinct bedding. The sandstone, calcareous in most places, occurs as discontinuous lenses about 3 feet thick at or near the base of the formation, and as discontinuous lenses as much as 30 feet thick in the upper one-third of the formation. The Madison Limestone is about 420 feet thick.

The Amsden Formation of middle and early Pennsylvanian (270-300 m.y.B.P.) and late Mississippian age consists of sandstone, siltstone, and dolomite. The sandstone at its base is equivalent to the Darwin Sandstone Member. It is about 180 feet thick and is fine- to medium-grained silty, friable, and thin-bedded. The dolomite is about 120 feet thick and occurs in the upper part of the formation. The lower part of the Amsden in contact with the underlying Darwin Sandstone consists of a thin-bedded clayey siltstone. The entire Amsden Formation is approximately 350 feet thick.

The youngest Paleozoic Formation in the area is the Tensleep Sandstone of middle Pennsylvanian age. The unit consists of slightly dolomitic and clayey, fine- to medium-grained sandstone. The beds are friable and distinctly cross bedded. Lenses of chert are common locally. The unit is approximately 300 feet thick. All other yonger Paleozoic and Mesozoic units have been eroded off of the WSA during recent geologic time.

The Wind River Formation of early Eocene (40-60 m.y.B.P.) age was deposited on the Paleozoic Formations. The Wind River Formation consists of interlayered and interfingering beds of sandstone, siltstone, claystone, local conglomerate, and discontinuous coal beds. Erosion remnants of the Wind River Formation are found throughout the area. The Wind River Formation is the bedrock across the southern portion of the area. It has been extensively eroded, but at least 1,000 feet probably still exist in the area.

2.3.2 Surficial Deposits

The surficial deposits include remnants of old pediment gravels, colluvium, and recent alluvium. Thaden (1980) recognized that there were probably several ages of remnant pediment gravels from the Holocene (< .5 m.y.B.P.) and Pleistocene (.5-1 m.y.B.P.) ages preserved in the area. These deposits consist of cobbles, gravel, and sand, derived primarily from the erosion of Precambrian rocks; these deposits also include some pieces of more resistant Paleozoic Formations. These deposits are as much as 30 feet thick but the average thickness is probably 10 feet.

Colluvium, which is derived from the weathering of bedrock and also includes talus, occurs throughout the area. Most of the colluvium is thin. Talus deposits occur along the bases of the higher cliffs. Alluvium, consisting of sand and gravel, covers the floors of the major drainages. Most of the gravel pieces were derived from the Precambrian rocks.

2.4 Structural Geology

The structure of the area is very complex. The Owl Creek Mountains were uplifted and the Paleozoic formations folded into a broad anticline. The anticline was highly faulted (i.e., northwest trending faults) forming a series of horst and graben structures (see Figure 2.1). The Boysen Fault, a major fault along the southern flank of the Owl Creek Mountains, is less than a mile north of the Birdseye area. Subsequent to or contemporaneous with the northwest faulting, major high angle northeast faults developed. The Wind River Formation was involved in the faulting, so the faulting is post Eocene (< 40 m.y.B.P.) in age.

2.5 Engineering Geology

No major engineering problems have been noted in the area. The Paleozoic formations are generally competent. Rockfalls, however, probably occur from the cliffs. Tertiary units are primarily silty and sandy, but they do contain volcanic ash deposits that would have a high shrink-swell potential due to their clay content.

2.6 Paleontologic Resources

The Paleozoic sedimentary rocks in the region undoubtedly contain some invertebrate fossils as is typical of these units throughout western Wyoming. Tourtelot (1957) describes numerous vertebrate fossils from the Wind River Formation but none have been identified in the WSA. The Wind River Formation along the southern part of the Birdseye area would be favorable for the presence of vertebrate fossils. An additional literature search and/or field investigation may be required to establish the value of this resource.

2.7 Historical Geology

The geologic history of the Owl Creek Mountains and the Birdseye area is similar to that of other areas of the Wyoming Basins. The Precambrian metasedimentary and metaigneous rocks are of Archean (> 1.8 billion years before present [b.y.B.P.]) age and their origin and history are not well understood. Starting in middle Cambrian time and throughout the Paleozoic, seas repeatedly advanced across the area leaving thick marine deposits. Toward the end of the Paleozoic era and into the early Mesozoic era, marine and nonmarine, or marginal marine conditions existed leaving deposits or shallow marine sediments, evaporites, and terrestrial deposits. During the deposition of the Paleozoic and Mesozoic sediments, stratigraphic traps for the accumulation of hydrocarbons may have developed along facies changes, unconformities, and lithologic boundaries. In Cretaceous time, the largest sea to ever cover North America advanced across the continent leaving thick marine deposits. The sea existed until near the end of the Cretaceous period. With the start of the Laramide orogeny, the seas withdrew, and the land was uplifted. In the Birdseye area, faults and folds developed as the Owl Creek range was uplifted and the Mesozoic muck of the Paleozoic strata was eroded off of the area. Thick units of terrestrial sediments were deposited. During the Tertiary period, the area was repeatedly uplifted, folded, faulted, and eroded. From the Cretaceous to Tertiary time, structural traps for the accumulation of hydrocarbons were likely to have developed in the region. In mid and late Tertiary time, volcanism developed to the north and west forming thick volcanic deposits locally and giving rise to widespread ash deposits. This volcanic ash may have been a source rock of uranium; the uranium may have

migrated by groundwater into favorable rock units in the area. The volcanism has continued until today. The Quaternary (2-3 m.y.B.P.) period is primarily noted for the glaciation that occurred in the mountains. The glaciers deeply eroded the valleys in the higher mountains and spread outwash deposits along their flanks. Neither the Owl Creek Mountains or the Birdseye area were at a high enough elevation to have been glaciated. Much of the geomorphology of the area was developed by stream erosion.

3.0 ENERGY AND MINERAL RESOURCES

3.1 General

There are no known or developed resources within the Copper Mountain WSA. There is a potential for uranium occurrences in the highly fractured Paleozoic formations and in the Wind River Formation (Hesse, 1982); a potential also exists for oil and gas occurrences in the Paleozoic formations below the Wind River Formation along the southern edge of the area. There is an abundance of limestone (Madison Limestone) in the area suitable for manufacturing cement or industrial or agricultural lime, but the distance of this resource from possible markets limits its value as a resource.

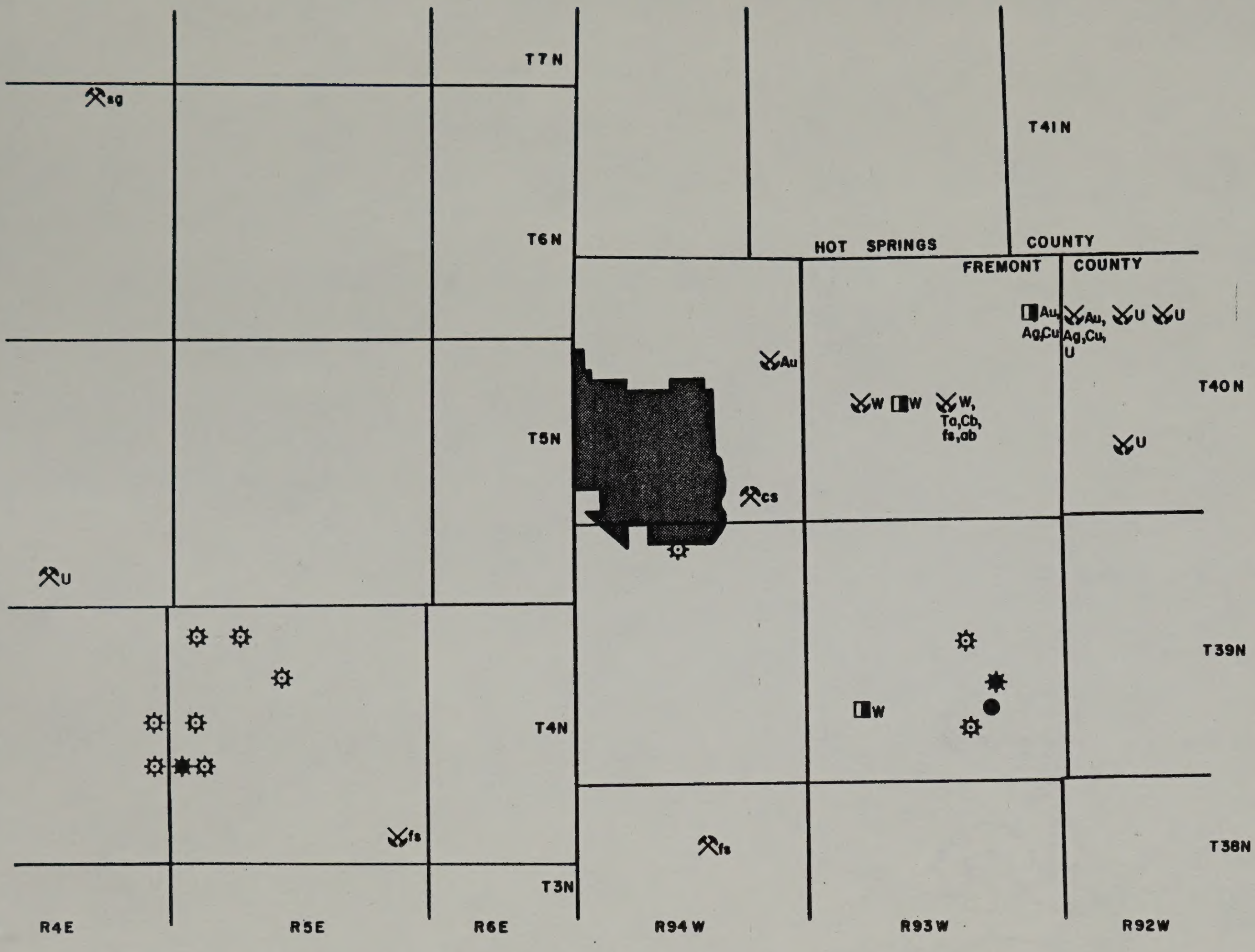
Figure 3.1, "Mineral Occurrence Map," illustrates the presence of any known past and present mine locations, or occurrences of mineral deposits and GEM resources within the GRA. Information for this figure came from the USGS' Computerized Resource Information Bank (CRIB); the USBM's Minerals Availability Information System (MILS); and the Petroleum Information Corporation (PI).

3.2 Potential Resources

The significant potential resources in the area are uranium, oil, gas, and limestone (Hesse, 1982; PI, 1982; Thaden, 1978). Hesse (1982) considers the Wind River Formation along the northern edge of the Wind River Basin as favorable for uranium deposits of the Wyoming roll-type. No deposits or anomalies have been identified within the Copper Mountain WSA; however, anomalies have been identified within the Birdseye GRA in the Wind River Formation which overlaps the Paleozoic formation along the south side of the

BLM Wilderness Study Areas Included in the Birdseye GRA

WSA	NAME	ACREAGE
030-111	Copper Mountain	6,858



● Oil Well

⚙ Gas Well

✸ Oil & Gas Well

⚒ Mine

⚒ Inactive Mine

■ Ore Body

◨ Deposit

▨ Approximate Boundary of Wilderness Study Area

COMMODITY

W	Tungsten
U	Uranium
Au	Gold
Ag	Silver
Cu	Copper
Ta	Tantalum
Cb	Colombium
fs	Feldspar
sg	Sand and Gravel
ab	Abrasives
cs	Construction Stone

N

(USGS, 1982; USBM, 1982; PI, 1982; Kelley, 1983)

5 4 3 2 1 0 3 6 Miles

5 4 3 2 1 0 5 10 Kilometers

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Birdseye GRA, Wyoming

MINERAL OCCURRENCE MAP

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REGION 6 WYOMING and MONTANA

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FIGURE 3.1

area. Several holes for oil and gas have been drilled within and to the south of the Birdseye area in Sections 1, 3, and 4, T 39 N, R 94 W (PI, 1982). These holes were probably drilled to test the Paleozoic formations below the Wind River Formation, or to test the erosional pinch-out of the Mesozoic formations below the Wind River Formation. What these holes encountered is not known, but the area of the Wind River Formation must be considered as potentially favorable for oil and gas occurrences.

Paleozoic limestone, suitable for the manufacture of cement or industrial or agricultural lime, occurs throughout the northern three-quarters of the Birdseye area (Thaden, 1978). This is true along the flanks of the Owl Creek Mountains for a considerable distance. Because of the distance to market and general inaccessibility of these deposits, it is questionable if they can be considered a resource.

3.3 Land Status

Oil and gas leases cover parts of the Copper Mountain WSA. Unpatented claims cover a portion of the western margin. Claims north and east of the WSA are probably the result of interest in uranium and metallic minerals. Figure 3.2, "Claim and Lease Map," illustrates the locations of any oil and gas leases, patented claims, or unpatented claims within the Birdseye GRA.

3.4 Deposit Types

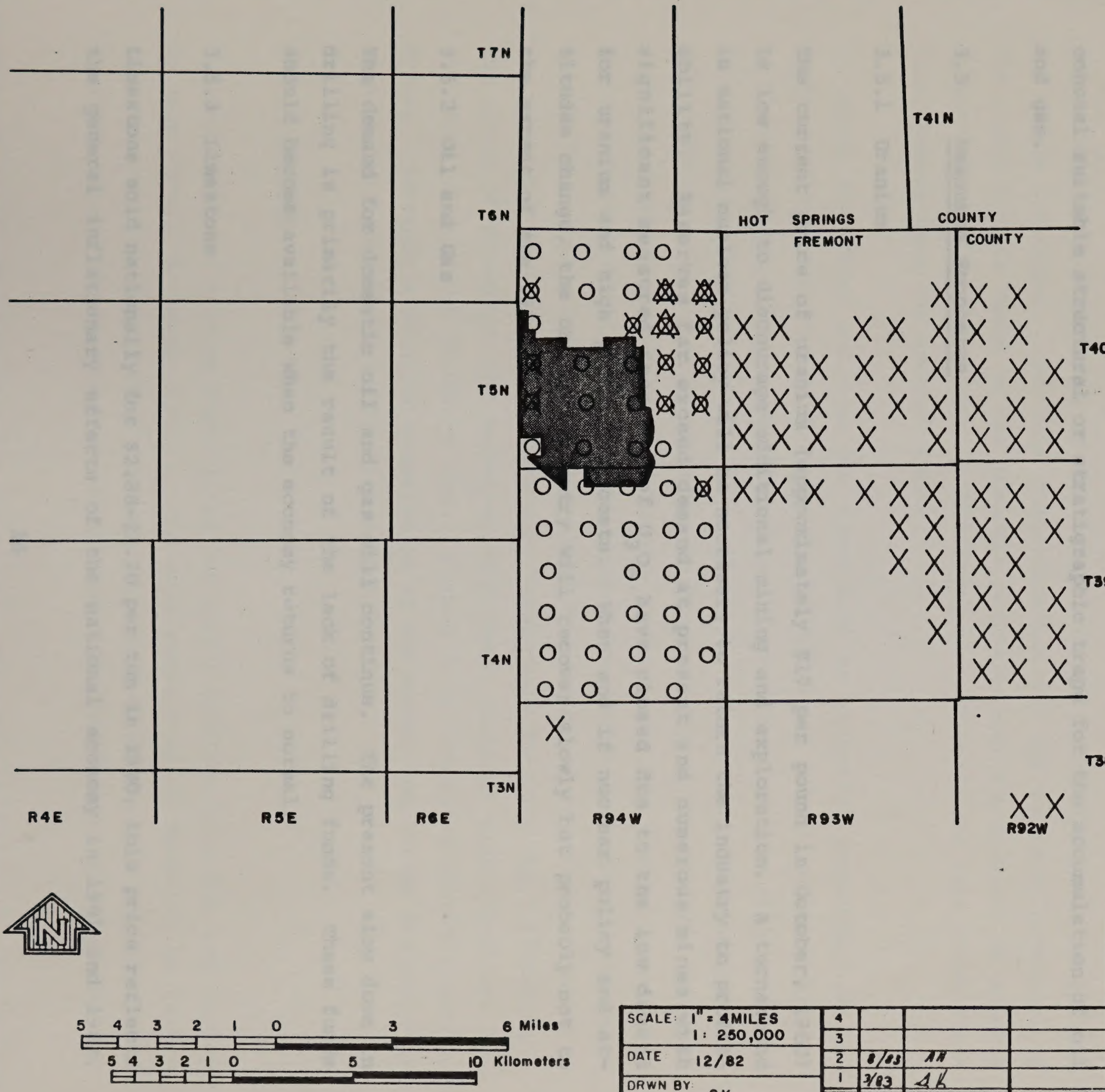
The potential uranium deposits in the area are of the sandstone roll-type in the Wind River Formation and fractured Precambrian rocks. Hesse (1982) considers the Wind River Formation favorable for uranium occurrences for the following reasons:

1. "The source of the uranium could be from the granite highlands of the Granite and Owl Creek Mountains and/or from previously overlying tufaceous sediments."

2. "The host rock is fluviatile, arkosic, permeable sandstone in an intermountain basin. It is interbedded with siltstones and mudstones."

BLM Wilderness Study Areas Included in the Birdseye GRA

WSA	NAME	ACREAGE
030-111	Copper Mountain	6,858



○ Oil & Gas Lease

△ Patented Claim

X Unpatented Claim

▨ Approximate Boundary of Wilderness Study Area

NOTE: Symbols illustrate those sections where claims or leases are present

(BLM, 1982)

Birdseye GRA, Wyoming
CLAIM and LEASE MAP

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		REVISIONS		

BLM GEM RESOURCES ASSESSMENT
REGION 6 WYOMING and MONTANA

TETRA TECH INC.
PASADENA, CALIFORNIA

FIGURE 3.2

3. "A reducing agent is available from the nearby petroleum fields."

4. "Traces of pyrite and kaolinization of feldspars are present in the subsurface data."

The potential for oil and gas occurrences in the study area is based on the abundance of oil and gas in the Wind River Basin (PI, 1982); the known geology of the basin; and the relationship between the geology and geologic history of the study area to that of the Owl Creek Mountains. The onlap of the Wind River Formation onto the Paleozoic formations of the Owl Creek Mountains could conceal suitable structural or stratigraphic traps for the accumulation of oil and gas.

3.5 Resource Economics

3.5.1 Uranium

The current price of uranium (approximately $17 per pound in October, 1982) is low enough to discourage additional mining and exploration. A turnaround in national nuclear policy will be necessary to return the industry to profitability. Reserves far exceed demand at present and numerous mines with significant measured reserves of U_3O_8 have closed due to the low demand for uranium and high production costs. When and if nuclear policy and attitudes change, the uranium industry will recover slowly but probably not to the extent of the 1970s.

3.5.2 Oil and Gas

The demand for domestic oil and gas will continue. The present slow down in drilling is primarily the result of the lack of drilling funds. These funds should become available when the economy returns to normal.

3.5.3 Limestone

Limestone sold nationally for $2.88-$3.20 per ton in 1980; this price reflects the general inflationary effects of the national economy in 1981 and 1982.

The major user of limestone is the construction industry which has been seriously hurt by the recession. Recent increases in housing permits and other construction projects should provide an increased demand for limestone.

4.0 LAND CLASSIFICATION FOR GEM RESOURCE POTENTIAL

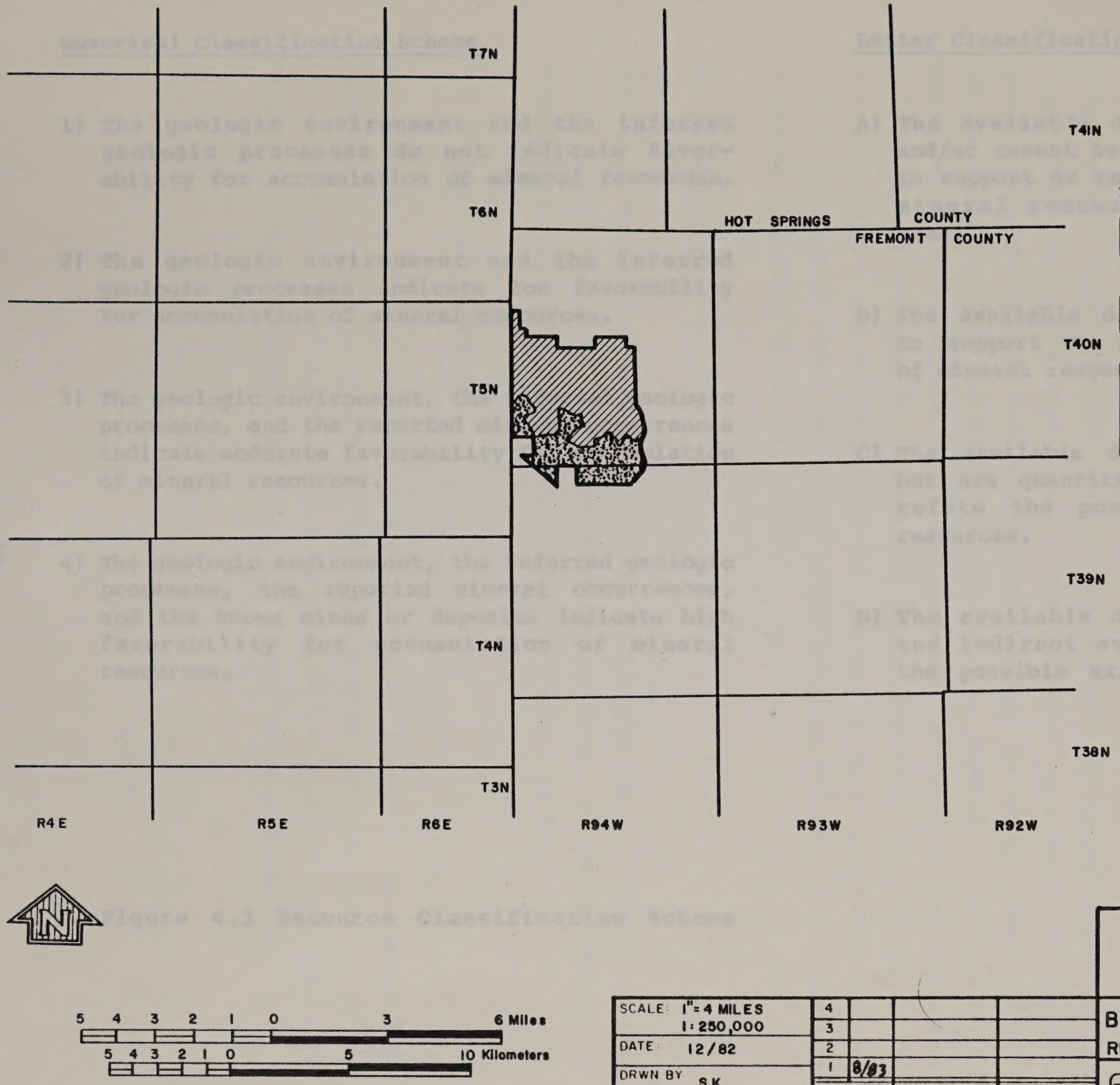
4.1 General

The Copper Mountain WSA has potential occurrences of the following GEM resources: uranium, oil and gas, and limestone. Because of different geologic processes, certain portions of the study area will have different potentials for these resources. The land classification for GEM resource potential in the study area is based on the geologic processes and the presence or absence of particular mineral resources. The level of confidence for this classification depends upon the available data.

In order to better evaluate the occurrence or potential occurrence of resources in the GRA, a 2-part resource classification scheme has been adopted as requested by contract. Each resource or potential resource within the GRA will receive an alpha-numeric classification. The number designation will range from 1 to 4, and will indicate the favorability of the geologic environment, geologic processes, and mineral occurrences for the presence of a particular resource or group of resources. The letter designation will range from A to D, and will indicate the level of confidence to be associated with the numerical designation. Figure 4.1, "Land Classification Map," illustrates the areas of potential GEM resources with their assigned classifications for the WSAs within the Birdseye GRA. Figure 4.2, "Resource Classification Scheme," provides a detailed description of the number and letter designations used in the resource classification scheme.

4.2 Uranium

The potential for uranium deposits in the Copper Mountain area has been reviewed in some detail by Hesse (1982). The area considered by Hesse to be favorable for uranium deposits is the area of the Wind River Formation along the southern margin of the Copper Mountain WSA. The geologic environment and the



BLM Wilderness Study Areas Included in the Birdseye GRA

WSA	NAME	ACREAGE
030-111	Copper Mountain	6,858

SYMBOL	GEM RESOURCE	CLASSIFICATION
▨	Oil & Gas Limestone Other GEM Resources	2C 4C 2C
░	Oil & Gas Uranium Other GEM Resources	2C 4C 2C
	Approximate Boundary of Wilderness Study Area	

SCALE: 1" = 4 MILES 1:250,000	4			
DATE: 12/82	3			
DRWN BY: SK	2			
APRVD: WL	1	8/83		
		DATE	DRWN BY	APRVD
	REVISIONS			

Birdseye GRA, Wyoming

LAND CLASSIFICATION MAP

BLM GEM RESOURCES ASSESSMENT

REGION 6 WYOMING and MONTANA

TETRA TECH INC.
PASADENA, CALIFORNIA

FIGURE 4.1

Numerical Classification Scheme

1) The geologic environment and the inferred geologic processes do not indicate favorability for accumulation of mineral resources.

2) The geologic environment and the inferred geologic processes indicate low favorability for accumulation of mineral resources.

3) The geologic environment, the inferred geologic processes, and the reported mineral occurrences indicate moderate favorability for accumulation of mineral resources.

4) The geologic environment, the inferred geologic processes, the reported mineral occurrences, and the known mines or deposits indicate high favorability for accumulation of mineral resources.

Letter Classification Scheme (Level of Confidence)

A) The available data are either insufficient and/or cannot be considered as direct evidence to support or refute the possible existence of mineral resources within the respective area.

B) The available data provide indirect evidence to support or refute the possible existence of mineral resources.

C) The available data provide direct evidence, but are quantitatively minimal to support or refute the possible existence of mineral resources.

D) The available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral resources.

Figure 4.2 Resource Classification Scheme

inferred geologic processes indicate a high favorability for the accumulation of uranium deposits of the Wyoming roll-front type. The studies of Hesse (1982) provide direct but quantitatively minimal evidence to support the possible existence of uranium deposits. Therefore, the area of the Wind River Formation is classified 4C for the occurrence of uranium.

4.3 Oil and Gas

Several oil and gas holes have been drilled in or adjacent to the southern margin of the Copper Mountain WSA. There has been no reported production of these resources in the study area. The structural complexity of the area makes it improbable that hydrocarbons occur within the area. Therefore, the geologic environment and the inferred geologic processes indicate a low favorability for the accumulation of oil and gas. The available geologic data provide direct evidence to support the conclusion that the area has a low favorability for the occurrence of oil and gas (Love et al., 1979; Thaden, 1978). Because of this, the entire Copper Mountain WSA is rated 2C for the potential occurrence of oil and gas.

4.4 Limestone

The Copper Mountain WSA has a high favorability for the occurrence of limestone (classified 4C); this classification is based on the occurrence of limestone in the Madison Limestone of the WSA (Thaden, 1978).

4.5 Other GEM Resources

Quantitatively minimal direct evidence exists to support a low favorability classification for the potential occurrence of other GEM resources in the WSA (classified 2C). This classification is based on the geologic environment and inferred geologic processes that have been identified within the WSA.

5.0 RECOMMENDATIONS FOR FURTHER WORK

5.1 Work Recommended to Complete Data Base

A number of investigations could be implemented to generate additional data to supplement the conclusions of this Phase I report for the Birdseye GRA. To complete the evaluation of potential uranium deposits in the area will require more detailed studies of the stratigraphy of the Wind River Formation within the area and more detailed radiometric traverses through the area. The stratigraphy of the area is only known in general. A series of stratigraphic sections should be measured throughout the area and the stratigraphy compared to that of known uranium occurrences in the Wind River Formation.

The probability of oil and gas occurrences in the study area is not considered as high as the potential occurrence of uranium. However, the available well logs (lithologic and geophysical) within and immediately adjacent to the study area should be obtained and studied. The logs should be studied and compared to evaluate further the possibility for the accumulation of oil and gas.

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Geology, energy,
(GEM) resource a

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